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Outdoors in Georgia

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ABOUT THE COVERS: Georgia's coastal marshes, teeming with life, are now protected from further destruction. (See "Protecting Our Marshes," page 19.) Photos by Bob Busby.

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Outdoor Commentary

Lloyd Summer, Jr.

The Department of Natural Resources has a new chairman of the board to introduce to you; he's Lloyd Summer, Jr., president of the National City Bank of Rome. He's also a great deal more.

Summer has been on the DNR Board since 1974, having been initially appointed by then-Governor Carter and subsequently reappointed by Governor Busbee. Last year he was vice-chairman of the Natural Resources Board.

Other achievements read like a page from a Who's Who of civic consciousness: The Jaycees Young Man of the Year; president, Rome Chamber of Commerce; president, Rotary Club; president, Floyd County Wildlife Association; chairman, Floyd County Development Authority; board member, Rome Boys Club . . . the list continues.

I've long been intrigued by Summer's educational background. He attended the School of Banking at LSU and later took part in the prestigious Senior Bank Officers' Seminar at Harvard University. There's nothing unusual about that; in fact it is entirely appropriate training for someone who runs a bank. It's what he studied before his academic exposure to finance that is so interesting.

He majored in American literature at Duke University and did more than a token amount of graduate work in English literature at Tulane.

There is a parallel that can be drawn between Summer's educational experiences and his view of our natural resources; that comparison has to do with the variety of his interest and the strength of his commitments.

As might be expected of someone who has been an avid outdoorsman for much of his life, Summer likes his game and fish plentiful and is dedicated both to the continued practice of sound wildlife management techniques and the development and implementation of new and ambitious programs.

His interests also include matters related to environmental protection. With the PCB problems that have affected rivers near his home in Rome, he is keenly aware of the problems that can accompany unwise use of our natural resources. One of his greatest concerns is that "we . . . become more vigilant than ever in protecting our water resources, both groundwater and surface water."

I conclude this writing with a sense of confidence and anticipation. Lloyd Summer inspires such reactions.

David Cranshaw

Mineral Springs

NATURE'S GREAT CURE

By Mary Eleanor Wickersham

Art & design by Michael Nunn

The crickets' songs accompanied the conversation, the beat marked by wicker rockers slapping the wooden planks on the long screened porch. Children's faces, flushed with sun and wind, slanted downward to avoid mothers' eyes. No one wanted to end the day. Full of fried chicken and country ham and all the garden's bounty, mothers tatted until twilight and sipped glasses of mineral water. Certainly, they were convinced, everyone would go home healthier.

The hope of better health drew thousands of people to mineral springs

all over Georgia during the nineteenth and the early twentieth centuries. With transportation slow at best, families were eager to find nearby places which offered clean rooms, good food and access to health-giving water. This demand created dozens of resort hotels nearly all associated with mineral springs and one especially fascinating hotel known for its electric rocks which, the owners claimed, could cure practically any disease. Such hotels were huge structures—usually two-story frame houses with large verandas—and were relatively self-supporting with their own gardens, cows and hogs. One example of Georgia's mineral-springs resort hotels is at Omaha Springs near Avera and is one of the few such buildings which still stands. Most of Georgia's other resort hotels were destroyed by fire earlier in this century.

Lucius Williams, part owner of the Omaha Springs property, says that his uncle, John Williams, originally built the structure for a hospital, hoping that one of his two sons would practice medicine there. Neither of the men became a doctor, but Williams' nephew did and practiced occasionally at Omaha in a small building near the hotel.

"Sometime around the turn of the century," Williams says, "Uncle John decided to turn it into a hotel and summer resort." It operated until 1910, drawing people from Augusta, Thomson, Warrenton Sandersville and Louisville at a cost of $1 per day per person and horse.

A former editor of the *Louisville News and Farmer,* Mrs. Hugh Saxon fondly recalls childhood summers at Omaha. "Every day we tried to dam up that stream. We'd leave at night saying, 'I think we've got it this time,' always to find the carefully laid branches washed away in the morning. I can't imagine why we were so determined to dam it up.

"On Sunday afternoons, buggies and wagons would come from everywhere," she continued. "Around the spring were some very rough seats—planks where people would come to sit or carry home cartons of water. They all thought it was medicinal."

Another story Mrs. Saxon tells is of a couple who went to the hotel in the '20s, when John Williams' son Ernest and his cousin Raphael Kelly lived there. "The couple knocked on the door and said they'd like to have lunch," Mrs. Saxon recalls. "Ernest and Raphael invited them in and served them a wonderful lunch. When the couple had finished their meal, they asked for their bill. 'Oh, there's no charge,' Ernest replied, 'The hotel's been closed for ten years.' "

Whether or not the hospitality was as fine at other hotels, the good food and amusements were enough to draw many people. Brochures for Beall Springs near Warrenton advertised their barbecued goat specialty which would, it said, "appeal to the daintiest appetites." The specialty at the renowned Elder Hotel at Indian Springs in Butts County was ox tongue and is still being served there. There were pavilions for dances, "joggling boards for the sentimentally inclined," and even string music two nights a week.

Nor were the children at a loss for things to do. Because the fathers often returned to town to work during the week, and the mothers were anxious for a respite from parenthood, the children, Mrs. Saxon says, were free to do just about whatever they pleased.

Resorts were found all over the state. Marietta had its own health resort, and Charles Morris says, in his *1907 The Old South and The New,* that Thomasville's climate "adapts it admirably to those

The Elder Hotel in Indian Springs.

Bob Busby

suffering from pulmonary troubles." Warm Springs was and still is probably the most nationally famous of Georgia's health resorts, but Lithia Springs near Atlanta and Indian Springs were once popular with people from all over the state. Indian Springs was generally conceded as the most popular mineral spa in Georgia.

An 1885 report by Georgia's Commissioner of Agriculture R. T. Nesbitt also listed Angier's Mineral Springs, Catoosa Springs (reputed to have 50 springs within sight of each other), Chalybeate Springs, Daniel's Mineral Spring, Franklin, New Holland, Porter, Powder, Watson and White Sulfur Springs as health resorts. The fact is, there were over 100 health resorts in the state, although many offered only a small pavilion or spring house.

There was one area, however, which drew people from all over the entire country. Hillman Springs in Taliaferro County was an immensely popular hotel in the years before 1900. Not only did the resort have two springs named Fever and Nausea for their anecdotal powers, it also had rocks which were believed to cure dyspepsia, nervous conditions and rheumatism.

A booklet prepared by the Hillman owners explains how the magical properties were discovered. Baptist minister Andrew Hillman, "somewhat of a mineralogist," as the brochure explains, had for years searched for alum and gold on his property. In bad health, Hillman hoped the exercise of drilling would be good for him. But in handling the drill, he felt a "peculiar sensation, similar to that experienced from a shock given by a galvanic battery."

"Sometimes," Rev. Hillman was quoted in the Richmond, Virginia *Dispatch*, "the hands could hardly hold the drill. To my great astonishment, I found my dyspepsia greatly improved and my rheumatism completely gone."

When news of Hillman's cure spread, neighbors flocked in to seek relief at the rock and from the mineral water. Hillman cut two holes into the rock where the spring water could accumulate and carved a seat out of stone for those who came there for the electric treatment.

An iron bar found not too long ago near the seat was apparently inserted into the holes on either side of the seat in the belief that the electric current could pass through the iron to the hands clasped on the bar.

Henry Grady became interested in the site and reported in the *Atlanta Constitution* that "fully half who go get relief." Grady was later to be only one of a number of prominent investors in Hillman Springs.

Doctors reported that they saw sharp increases in pulse rates and a Dr. Devine stated that the pupil of an eye of one woman did not respond to light upon leaving the tunnel. Perspiration increased and violent shaking often resulted from trips to the healing tunnel. Sufferers sometimes spent days and nights in the shaft, expecting cures.

One man who was cured said in answer to nonbelievers, "You cannot argue away the crutches, for they

The spring well at Omaha Springs.

Kevin Schochat

are here." He did concede, however, that he did not blame the medical profession for doubting that a rock could give a better cure than a doctor.

But controls on the rock were impossible and some patients, the brochure says, became overcharged. One day in the tunnel one sufferer, talking to invalid Fannie Pouser of South Carolina, noticed that Fannie did not reply. Found to be unconscious, she was removed from the tunnel. On waking "she was delighted to have been shocked and believed herself much better for it."

Other testimonials to the curative powers of the rock and the surrounding springs told of relief for kidney ailments, liver disease, rheumatic gout, poor circulation, compressed nerves of the ankle, nervous conditions and cholera. Water from Nausea Springs was even tested on an ocean voyage, and the experimenters said it proved effective in combating seasickness. Of course, the water from Nausea Springs was "a fine table water" as well.

The booklet *Rocks that Shock* explains the phenomenon very simply: "Nature provides a cure for every ailment of Adam's race." Whether the rock affected the sufferers or changes were the result of hysteria as some doctors said, people became believers.

The old hotel at Hillman Springs burned long ago. Although a sheer rock face and its carved seat remain, the roof of the electric shaft has caved in and its manmade walls have crumbled. A powerline cuts through the wooded area only a few hundred yards away.

A family now lives in the Omaha Springs Hotel. Picnickers still go there and not infrequently do visitors come with jars to take home some of that precious water.

Beall Springs is still owned by the same family, but the site of the springs is open for picnicking and is maintained by the Warrenton Kiwanis Club. The water whose chemical formula was once proudly advertised now spews forth from cement.

Lucius Williams still goes regularly to Omaha to get his water. My own physician grandfather often drove to Indian Springs to bring a supply home for family, friends and patients.

Perhaps the brochure was right about nature having a cure for everything. Smelling the honeysuckle on a June night after a day of play, swimming in a cool creek, swinging from giant oaks, and consuming blackberry cobbler with fresh cream—they are at least part of nature's cure, and they beat taking vitamins any day.

Mary Eleanor Wickersham is a newspaper columnist and freelance writer living in Sandersville. Kevin Schochat is a freelance photographer who also lives in Sandersville.

The Nature Conservancy

by Anne M. Byers
Senior Writer, Nature Conservancy

A number of years ago speculators eyed the remaining undeveloped islands just off Georgia's coast—the remnants of the state's famed Golden Isles. The family owning one of the islands, Wassaw, did not want to sell the untouched property for development but preferred, instead, to find a means of maintaining and protecting the island's wildlife and natural beauty. Wassaw's owners sought help from The Nature Conservancy, a national private conservation organization devoted to preserving natural lands across the country, often by purchasing areas outright or by accepting gifts of land.

Unfortunately, $1 million was needed to satisfy requirements for the owners to offer the 11,000 acres of forests and surrounding salt marshes as a partial gift and sale to The Nature Conservancy. The threat that Wassaw might be acquired by people trying to place a causeway and recreational complex on the island—after which another nearby island would be developed—loomed very large. At the last moment, the Conservancy received a donation of securities valued at $1 million. Using proceeds from the stock sale, the Conservancy purchased Wassaw and gave it to the U.S. Fish and Wildlife Service for management and protection. Thanks to the Conservancy's prompt actions and negotiating capabilities, and the generosity of a single donor, the island today remains a remarkable place with gnarled live oaks and ancient pines, where the beaches and forests safeguard lush marshes and precious wildlife.

The acquisition of Georgia's Wassaw Island is only one example of how the Nature Conservancy works to preserve ecologically significant lands and the diversity of life they support. It preserves natural areas in a variety of ways: by identifying the lands that contain the best examples of all the components of the natural world; by protecting areas through purchases or gifts of land, or donations to buy land; by assisting or advising government agencies or other conservation organizations in preserving areas; by promoting proper use of natural areas and increasing public awareness of the need to safeguard our remaining wildernesses. Furthermore, once an area is acquired, skilled volunteers and staff are provided to protect and manage the land, or it is transferred to an agency more suited to care for it. The Conservancy presently manages 660 of its own sanctuaries. A nonprofit organization, the Conservancy's activities are made possible through general contributions, foundation grants, gifts from individuals and corporations, membership dues and recovery of expenses.

Operating from national headquarters in metropolitan Washington, D.C., the Conservancy also maintains four major regional offices. State, field, unit, or project offices are professionally staffed in an additional 22 states. Its staff is comprised of people with backgrounds ranging from ecology to real estate and law. Thirty volunteer chapters are located in 25 states; membership presently stands at 47,000.

The events that now enable the Conservancy to complete some 200 land preservation projects per year were an outgrowth of propositions first championed in the early 1900s by pioneer ecologist Victor E. Shelford and his colleagues. In 1915 Shelford and his associates founded the Ecological Society of America. Recognizing the fact that the country's natural areas were increas-

In addition to the Wassaw Island purchase, the Nature Conservancy assisted the state, through DNR's Heritage Trust Program, in acquiring Ossabaw Island. A $4 million donation from Atlanta's Robert Woodruff also made this purchase possible.

Bob Busby

ingly endangered, the Ecological Society established the Committee for the Preservation of Natural Conditions in 1917. It is to this group of scientists, as well as to its companion—the Committee for the Study of Plant and Animal Communities—that the Nature Conservancy traces its beginnings.

In 1946 the two committees became a separate entity, the Ecologists Union. After a few years of operation, during which the Union was primarily concerned with encouraging other groups to establish natural areas, the organization's membership decided that a direct and active role in natural area preservation could make the Union more effective. Consequently, the Ecologists Union became the Nature Conservancy in 1950, and in 1951 was incorporated in Washington, D.C. as a nonprofit association chartered for scientific and educational purposes. At that time the Conservancy had 342 members.

The new organization spent its first three years experimenting with various methods of safeguarding natural lands. In 1953 a bold step was taken. When a group of Connecticut residents asked for affiliation with the Conservancy in order to raise money to preserve the Mianus River Gorge in Westchester County, New York, the Conservancy assisted in saving the 337-acre gorge by buying it. This first independent project marked the beginning of the direct acquisition program for which the Conservancy has become known. The number of preservation projects spiraled upward annually to 21 by 1961, to 100 by 1969, and to over 200 by 1973.

But there is something beyond numbers and dates that speaks most for the Conservancy's efforts and accomplishments—the land itself. From the nation's East Coast to its West Coast, the organization has protected some of this country's most precious and beautiful natural lands and wildlife habitats.

The mysterious Great Dismal Swamp is an example of what U.S. corporations can do for conservation. Lying half in Virginia and half in North Carolina, the Dismal is one of the few true blackwater swamps remaining in the East. In 1973 the Union Camp Corporation donated 50,000 acres of the Great Dismal to the Conservancy. Another 11,000 acres of the swamp were given by the Weyerhaeuser Company in 1976. The refuge provides habitat for bear, bobcat and river otter, as well as for roughly 75 species of birds (two endangered) and many uncommon plants. Towering above the swamp like ancient and eerie sentinels, the Dismal's bald cypress trees predate the birth of America; some may be as old as 1,600 years. Along with several purchases, the Conservancy has acquired some 89,000 acres of the Great Dismal, most of which is now owned and managed by the U.S. Fish and Wildlife Service.

Two wildernesses in Maine were donated by the J. M. Huber Corporation—3,793-acre Crystal Bog and an eight and one-half mile stretch of the Seboeis River. Identified as the "largest, finest unspoiled northern sphagnum-heath bog in the U.S.," Crystal Bog was dedicated as a National Landmark in 1974 and harbors at least 10 species of orchids. The Seboeis River is fed by spring melts that turn it into a torrent of white water, parts of which have never been successfully canoed. Its clean, cold waters form a dramatic gorge along a three-mile stretch. Both areas are managed by the Conservancy's Maine Chapter.

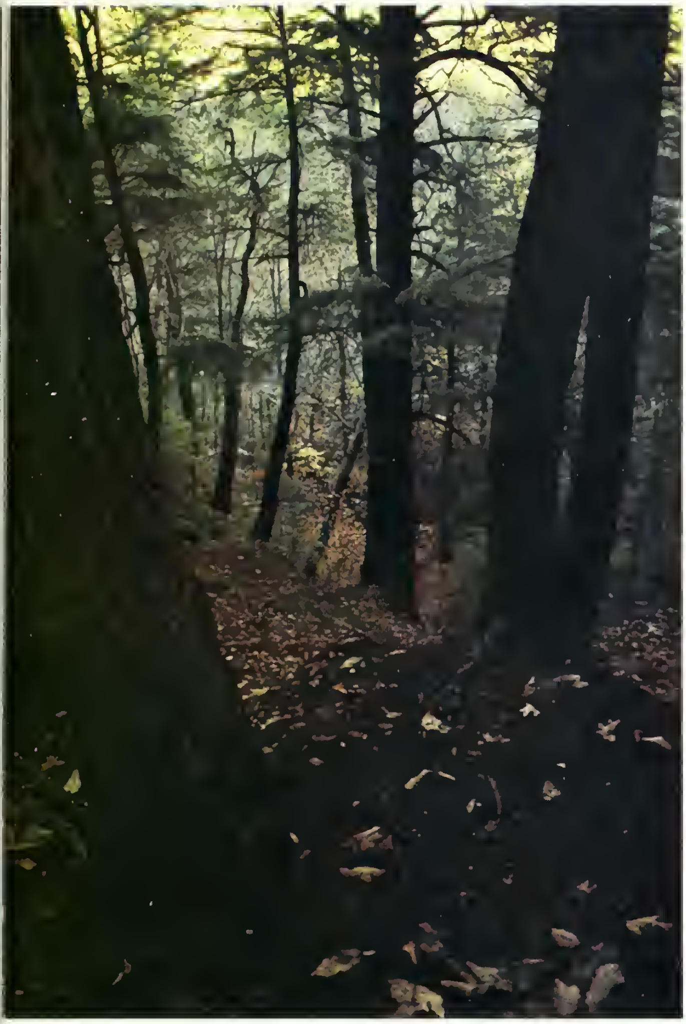
The Nature Conservancy has been very active in protecting our country's few remaining native grasslands. A gently rolling wet prairie, the 7,600-acre Samuel H. Ordway, Jr. Memorial Prairie in South Dakota, supports an immense variety of waterfowl, including giant Canada geese. Even the rare ferruginous hawk builds its unique stick nests on the prairie's grassy hillcrests. Owned by the Conservancy, Ordway is used as a research station to study the techniques for preserving and restoring our other dwindling grasslands. Also a research natural area, the virgin tallgrass Konza Prairie in Kansas was purchased in early 1977 with an anonymous donation of $3.6 million. The preserve's 8,100 acres of grasses, which grow as tall as 8 to 10 feet, shelter coyotes, red-tailed and Swainson's hawks, upland plovers and threatened northern greater prairie chickens.

Believed to be the largest single segment of land ever acquired for conservation by a private organization, the 220,000-acre Sevilleta National Wildlife Refuge in New Mexico came into being on December 28, 1973. On that day the property was sold for a fraction of its value by the Campbell Family Foundation to the Conservancy, which then donated the area to the U.S. Fish and Wildlife Service. The land was purchased with financial assistance from the Mary Flagler Cary Charitable Trust, a New York philanthropy.

Financial support from the Cary Charitable Trust also enabled The Nature Conservancy to purchase, over a seven-year period, 13 of Virginia's 18 Atlantic barrier islands. Now called the Virginia Coast Reserve, the islands stretch for 45 miles along the Delmarva Peninsula and encompass the only unbroken barrier island chain in the U.S. preserved in its natural state. Owned and managed by the Conservancy, the islands are renowned for their large concentrations of shorebirds, seabirds and migrating and wintering waterfowl. During the last bird count taken on the islands, 2,000 greater snow geese were reported—10 percent of North America's population of the species. Of the 10 species of hawks finding refuge in the Reserve, the endangered peregrine falcon can be spotted from all the beaches; threatened pigeon hawks, or marlins, and ospreys also have been observed. Furthermore, the Virginia Coast Reserve's surrounding salt marshes are reported to serve as nursery and breeding grounds for 90 percent of the commercial finfish and shellfish caught off the Virginia/Maryland coast.

Another coastal area, this time off California, was optioned last fall for purchase by the Conservancy. Largest of the Channel Islands, Santa Cruz harbors endangered Channel Island fox, which hunt throughout the forests and grasslands of the island. Highly endangered brown pelicans, which breed and nest on a nearby

Tim Loomis



Through the Nature Conservancy's efforts, over 200 land preservation projects are completed each year. Among the 1.3 million acres across the United States preserved by the Conservancy to date are: the 337-acre Mianus River Gorge in Westchester County, New York (left), the Conservancy's first acquisition project; Santa Cruz, the largest of California's Channel Islands where endangered brown pelicans (below left) breed; Virginia's 18 barrier islands (bottom), the only unbroken barrier island chain in the U.S. still in a natural state; and the Konza Prairie in Kansas (below).

Susan Bournique

John Hall

Tim Loomis

island where there are no predators, fish in the coastal waters of Santa Cruz. According to the University of California Marine Sciences Institute, the island supports six endangered plant species that are found nowhere else in the world, as well as 25 other plants that grow only on Santa Cruz and on some of the other Channel Islands. California sea lions, harbor seals and an occasional elephant seal frequent the island's rocky sea ledges. Options were obtained from the Santa Cruz Island Company and its shareholders to acquire control of 90 percent of the 87-square-mile island. The Conservancy is presently conducting a $4 million fundraising effort to meet the purchase price and to provide for future management of Santa Cruz Island. The Atlantic Richfield Foundation was the first contributor with a $75,000 donation.

The Conservancy has saved several areas that provide habitats for our country's endangered "national symbol," the bald eagle. One of the largest of these preserves is Washington's Skagit River Bald Eagle Sanctuary. Each year, from mid-November to the end of February, a splendid congregation of eagles appears on the middle expanses of the Skagit River, the westward flowing river that originates in the North Cascade Range and vanishes into Puget Sound. The gathering is the largest known wintering population of northern bald eagles on the West Coast of the continental U.S. Ornithologists believe the great birds have been congregating along the river's banks and bars to feed on spawning salmon for about 10,000 years. Comprised of land acquired through partial gifts and purchases from rancher Fred Martin, the Simpson Timber Company and the Scott Paper Company, the sanctuary presently contains over 1,000 acres and is managed by the Conservancy and the Washington State Department of Game.

Preservation of the Pascagoula Hardwood lands is one of the Conservancy's finest achievements. Identified by the Mississippi Natural Heritage Program as the single most important natural area remaining in Mississippi, the 32,000-acre bottomland comprises a wilderness abounding in wildlife of every sort. Mammals include deer, raccoon, beaver, otter, mink and muskrat. Endangered Florida panthers have been sighted by reliable observers. Green, little blue and great blue herons, wood duck, pileated woodpecker and the rare swallow-tailed kite are a few of the many resident birds. The endangered rainbow snake, the threatened yellow-blotched sawback turtle and the rare glossy watersnake have been observed. Critical plants include threatened blue needle palm and rare odorless wax myrtle. After three years of complex negotiations, the Conservancy acquired the vast wilderness along the Pascagoula River and transferred it to the Mississippi Wildlife Heritage Committee.

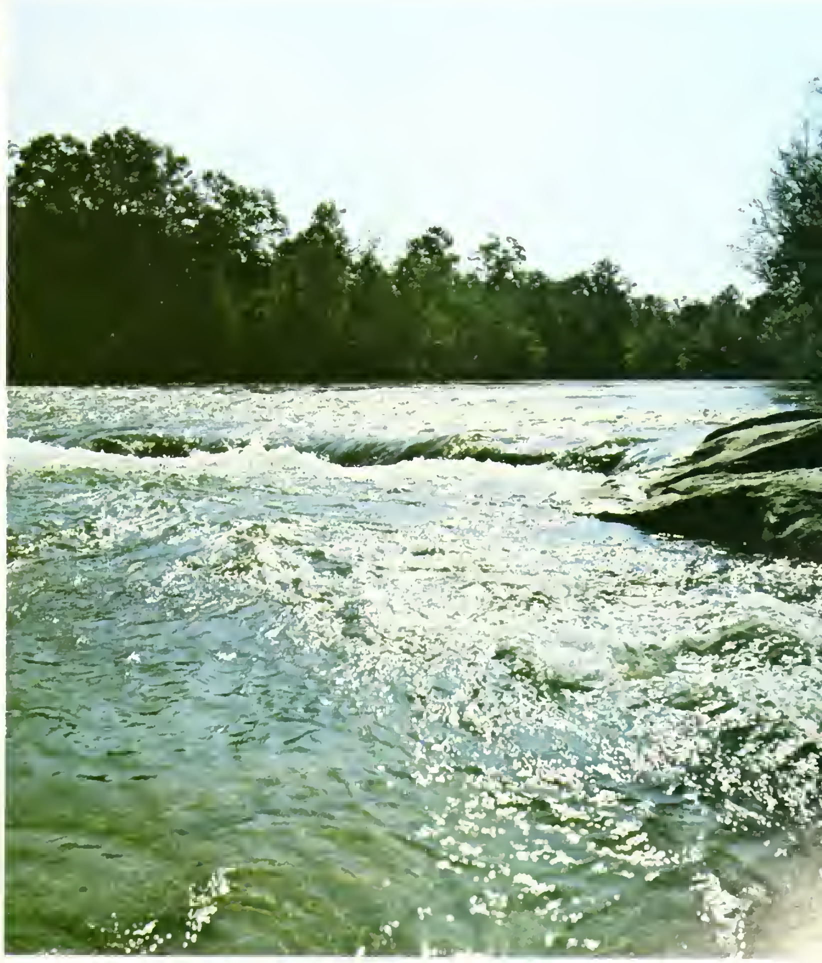
The sanctuaries described in this article are only a few examples of over 1.3 million acres of islands, swamps, prairies, mountains and deserts the Nature Conservancy has preserved or assisted in preserving across the country. In the state of Georgia, the organization has been involved in saving some 70,000 acres. Most of this acreage comprises projects in which the Conservancy assisted the state, particularly in acquiring areas for Georgia's Heritage Trust Program—a 10-year plan created and implemented by (then Governor) Jimmy Carter in 1972 to preserve the state's outstanding environmental, cultural and recreational areas. Under the program, millions of dollars of priority lands have been protected for present and future generations of Georgians. Examples of Heritage Trust preserves are Lewis Island, which lies near the mouth of the wild Altamaha River; the 800-acre Phillips Tract, containing the largest known breeding population of an endangered plant, the Georgia plume; three tracts of land along the scenic Chattahoochee River; the crown jewel of the Georgia Golden Isles, Ossabaw Island, and its neighboring 26,000-acre savannahs at Genesis Point; Pickett's Mill; Pigeon Mountain; Watson's Mill Pond; the Wormsloe Plantation; and parts of Sunbury Historic Site.

Both the state and the Conservancy have benefited from their cooperative efforts to safeguard Georgia's natural and cultural heritage. Georgia's experience with its highly successful program has led the Nature Conservancy to assist other states in establishing their own heritage programs. Today, ten states and the Tennessee Valley Authority have developed natural heritage programs in cooperation with the Conservancy. Collectively, these standardized programs cover over 20 percent of the nation's landscape, excluding Alaska. The state heritage programs are demonstrating that private and governmental interests can cooperate and succeed in accomplishing much that neither could achieve alone.

Jim Couch

The Nature Conservancy has been involved in preserving over 70,000 acres in Georgia including: Lewis Island on the Altamaha River (left); Pigeon Mountain in northwest Georgia (below left); and three tracts of land along the Chattahoochee River (below right).

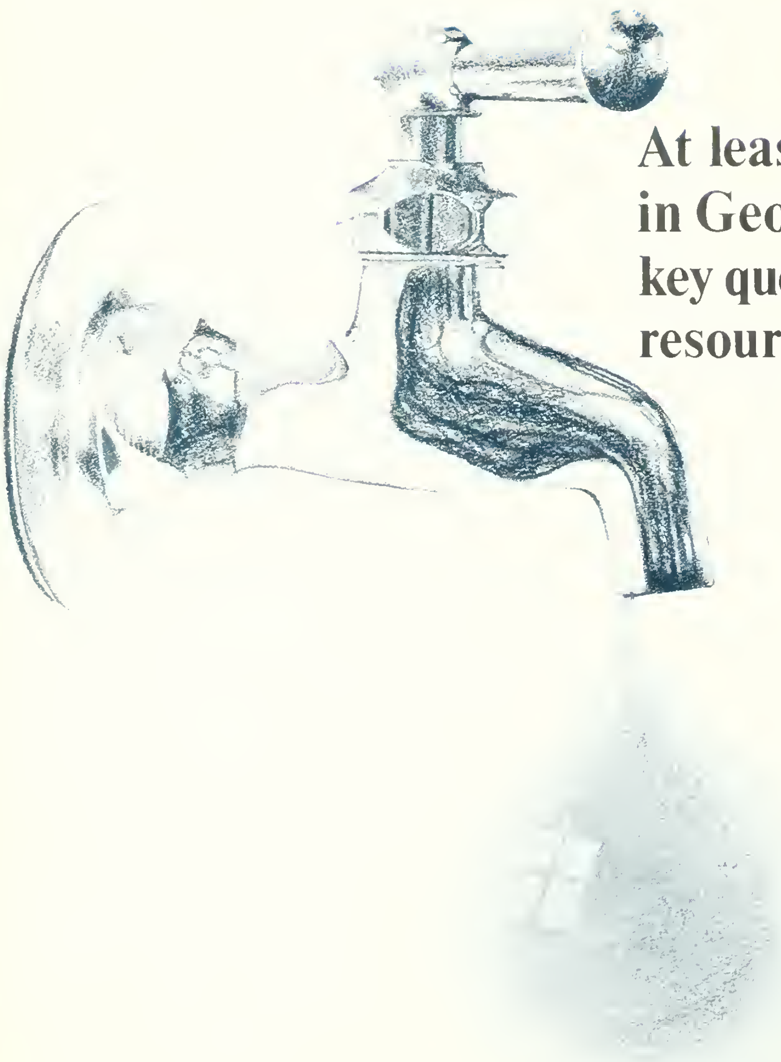
Jimmy Valentine



Bob Busby

GROUND WATER

by Lucy Justus



At least 95% of all the fresh water in Georgia is groundwater. But some key questions about this important resource still need to be answered.

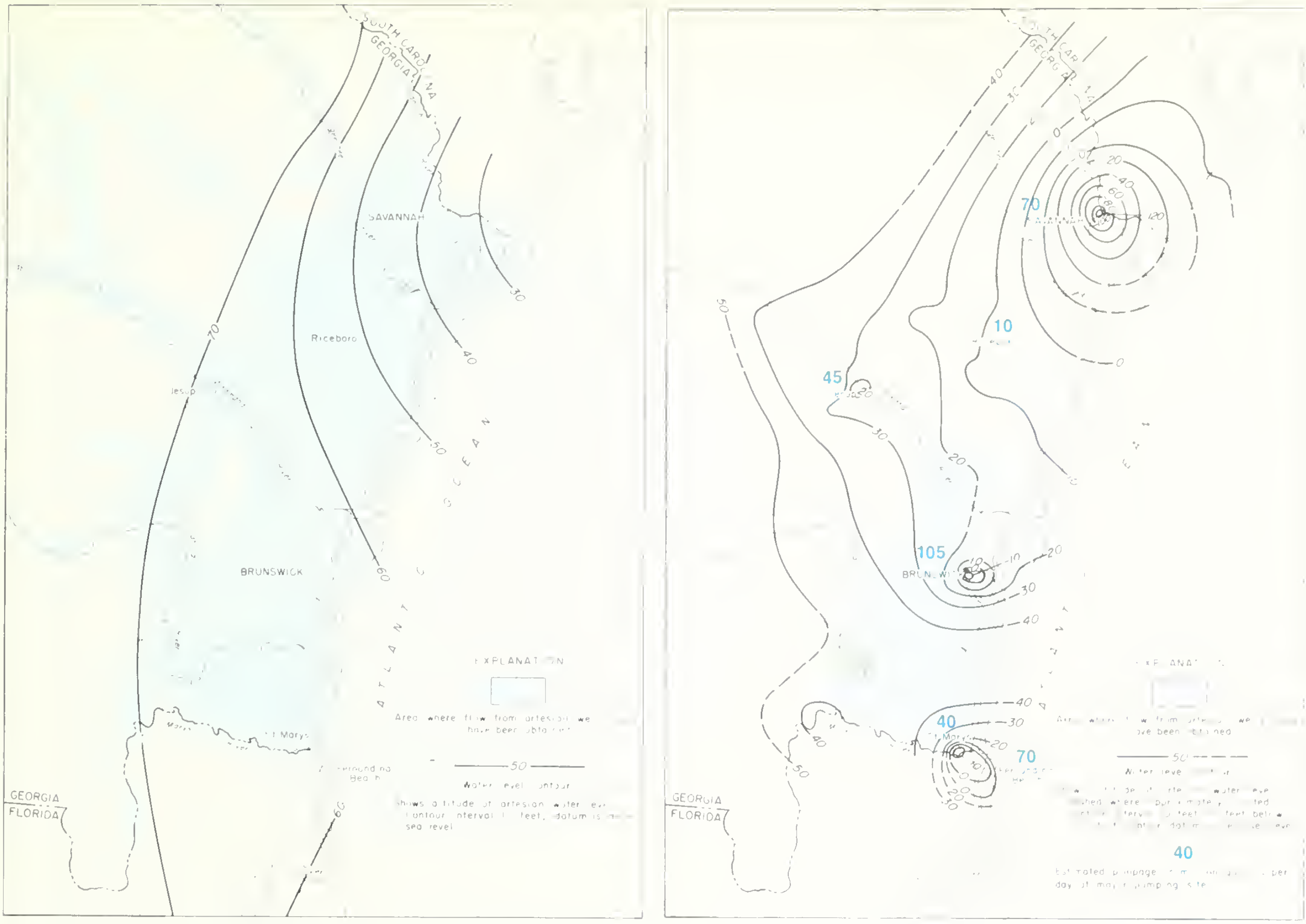
Since Georgia's Piedmont Plateau is underlain by crystalline rocks about as porous as Stone Mountain, people have always believed the area had virtually no groundwater.

But that may not be true.

"We think once the fracturing of the granite and granite-like rocks is well understood, it may be possible to get large yields of groundwater," said Sam Pickering, director of the Geologic and Water Resources Division of the Department of Natural Resources. "There will never be enough groundwater to solve Atlanta's problems, but there could be enough to relieve some of the demand and to have quite an effect on cities on the outskirts of Atlanta and through the rest of the Piedmont.

"Our organization and the U.S. Geological Survey are now working on understanding the fracture systems and on an inventory of wells to see what kind of yields are possible from small wells presently being put in."

Obviously, the Piedmont rocks are not permeable enough to contain groundwater, but in many places they are highly fractured along zones which may be



1880

1971

The blue areas on both maps show where wells drilled into the aquifer limestone would have produced water at the surface without pumping. The blue figures on the 1971 map are the millions of gallons pumped daily at the various locations. Because of the vast withdrawals, wells no longer flow from artesian pressure.

several miles long and several hundred feet wide. The fissures often form organized patterns and tend to concentrate along linear bands called lineaments, Mr. Pickering explained. Because the broken rocks are weaker, they are more susceptible to erosion.

Water drains into the fracture zones, weathering the rock and producing a soil called saporlite which acts as a sponge, holding some water and permitting some to make its way into the deeper fractures and erode that rock. The linear features are low areas, and streams tend to run along them, helping to recharge the underground system.

"Many wells in these areas yield large quantities of water," Pickering said.

The study of the fracture system is part of a cooperative groundwater research program of the Department of Natural Resources and the U.S. Geological Survey. The object of the study is to document the groundwater resources of the state, including, among other things, potential yields, depth, chemical characteristics of the water and best development techniques. The project will take years to complete, but a proposed five-year program, if approved, will intensify efforts and help to solve some immediately pressing problems.

In recent years, it has become increasingly apparent that present knowledge about Georgia's groundwater systems is insufficient to cope adequately with emerging problems.

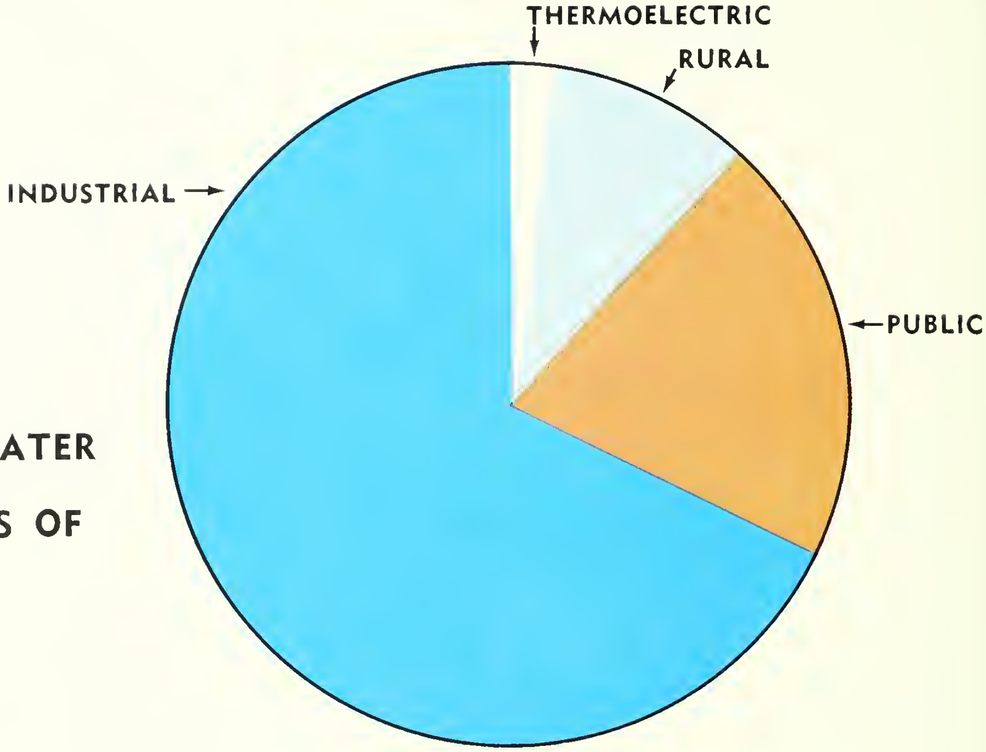
Suppose, for instance, you are building a house in the north Georgia mountains or on the Piedmont and need a well. How do you know if there is water or solid rock beneath the soil?

Many Georgians who did not know have wasted hundreds of dollars digging desert-dry holes in the ground.

Moving to another area of the state, suppose you live in a place where there is an aquifer containing ancient sea water just below one containing an abundance of fresh water. If you are planning a well there, it would be helpful to understand the arrangement of aquifers and what they contain. Otherwise, you could spend more money than necessary drilling a well deeper than necessary and end up with unnecessarily contaminated water.

That has happened in Georgia.

Suppose you are responsible for the water supply of a



TOTAL GROUNDWATER IN 1975 WAS 814 MILLION GALLONS OF WATER PER DAY

coastal city. An industry which requires large quantities of water wants to locate there. Will the additional withdrawals bring the water level in the aquifer down enough to permit the entry of salt water, contaminating the city supply?

Or suppose you need a well in south Georgia to produce 1,000 gallons a minute. One in a certain place may yield 300 while one a few hundred feet away could produce 1,200. How do you know where to drill?

And where do you find the answers?

You may not. They are available for some parts of the state but not for all, and people are often surprised that such information cannot be quickly supplied. But like most things, the groundwater situation has grown more complicated with the passage of time.

"In the past, it has been relatively easy for almost anyone to drill a well and get water for almost anything they needed," said David Swanson, chief hydrologist for the Geologic and Water Resources Division.

Now the population has grown enormously, spreading over granite-based peaks and sandy flat-lands as well as fertile valleys and requiring more and more water for more and more things.

Heavy industrial and municipal use on the coast has lowered the pressure in the principal artesian aquifer, permitting salt water to contaminate fresh groundwater in areas of heavy pumpage.

In parts of inland Georgia, irrigation has doubled and tripled in the last few years, raising the question of whether aquifers there can supply growing irrigation, domestic and industrial needs. People are beginning to ask such things as: what effect will my neighbor's irrigation system have on my well? Is the water level declining because of water use or climate?

The state's economy, municipal growth and industrial development are now affected by the availability of adequate water of suitable quality. And locating that supply is no longer a matter of deciding what river to use or where to dig a hole. It is a matter of understanding a vast and intricate system.

David Swanson explained the type of information required and the levels on which it is classified.

"The first is called the data level," he said. "That means we have some information on existing wells in the area. We might have a geologic map and some basic water information, but no interpretative reports.

"At the reconnaissance level, which is next, we try to define the geology of the area, the geometry of the aquifer systems, the groundwater levels and the water quality and use. We also attempt to estimate the yield of a properly constructed well.

"We now have only about 14 percent of the aquifer systems covered by this minimum level of knowledge.

"At the planning level, we try to determine the discharge-recharge relationship of the aquifer systems and the ideal pumping level and to estimate certain other parameters. The key word here, however, is 'estimate.'

"On the management level, we try to define all aspects of the groundwater system. All the geologic, hydrologic and water-use information is then integrated into a digital model which can be used to predict, very rapidly, what any change in water use will do to the water level or chemical quality in the aquifer.

"It is not the type of thing where you can spend a year investigating and come up with all the answers," he added. "You could assign 25 people to such a study and they would not be able to develop the answers in a short time. It takes many years to develop what I might call even rudimentary information.

"There are only two areas in the state—Brunswick and Savannah—where we have what we feel is the beginning of management level information, and in both places there is still a great deal of material we have to collect. We are striving for management level information for the whole state. It is the level where we can begin to say what the cause and effect is."

One goal of the proposed five-year program is to reach the reconnaissance, or second, level within that period.

"The information we have now is the result of 40 or 50 years' work," Sam Pickering said. "In any groundwater research program, it is important to understand you can't put on a crash program and quickly develop even reconnaissance level information. Everything depends very substantially on a historic record that goes back many years or even decades."

Many things affect groundwater quality and quantity and they frequently vary from year to year.

One advantage to the extensive research program is that it will provide not only facts but accurate interpretations of facts which may help to prevent such misunderstandings as the one about Georgia's principal artesian aquifer. Periodically people figure the capacity of the aquifer and come up with the observation that it contains enough water to supply all the area's needs for centuries even if no rain should fall during those centuries.

"That aquifer holds a staggering amount of water, but it would be physically impossible to withdraw all of it," David Swanson said. "If it were possible, you would most likely run into significant water quality problems before you even got started."

One of the problems could be salt water which has been in the aquifer for ages.

"The aquifer limestones were formed tens of millions of years ago on the bottom of the sea," Sam Pickering said. "Unless all the salt water has been completely flushed out, they contain what is known as connate water, which is the original water that was trapped in the sediments when they were deposited—very ancient sea water, if you will.

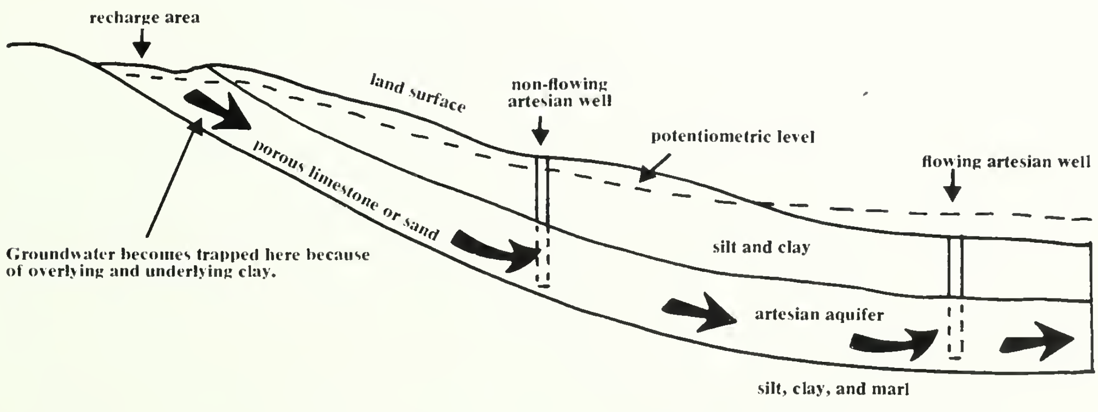
"Some of the limestones were not deposited in deep, clean sea water. They were deposited in tidal flat conditions where there were reefs and pools behind the reefs. The water evaporated and minerals called gypsum and anhydrite formed. These minerals were buried deep in the limestone layers and when groundwater comes into contact with them and other sulfate minerals, the result is very bitter, hard, brackish water which doesn't meet state standards."

Valdosta had trouble with these minerals. "From the Brooks, Lowndes and Echols County study, which has just been completed, it was found that the upper aquifer was a very capable one but there was not a very clear-cut separation between it and the one below it," Pickering said. "When you drill down further than a few hundred feet you get into a zone of very brackish sulfate water of such poor quality it will not meet state standards. We found Valdosta had been drilling many of its wells in the general area much too deep and were bringing water of very poor quality up into the top aquifer."

The aquifer system on the coastal plain is immense and complex and at this point no one knows the extent of either the immensity or the complexity.

In some areas there are as many as six distinct aquifers within a comparatively small area. In some places

SIDE VIEW OF TYPICAL ARTESIAN AQUIFER



Georgia still has large quantities of groundwater and it is generally of very high quality.

they are stacked; in others, they are spread out like the fingers on an open hand. The aquifers in a given area may be the same age or there could be millions of years of difference in the ages.

Does anybody know how many aquifers there are in the state?

"Absolutely not," Sam Pickering said. "But we are sneaking up on it. That is one of the things we hope to find out during the next five years."

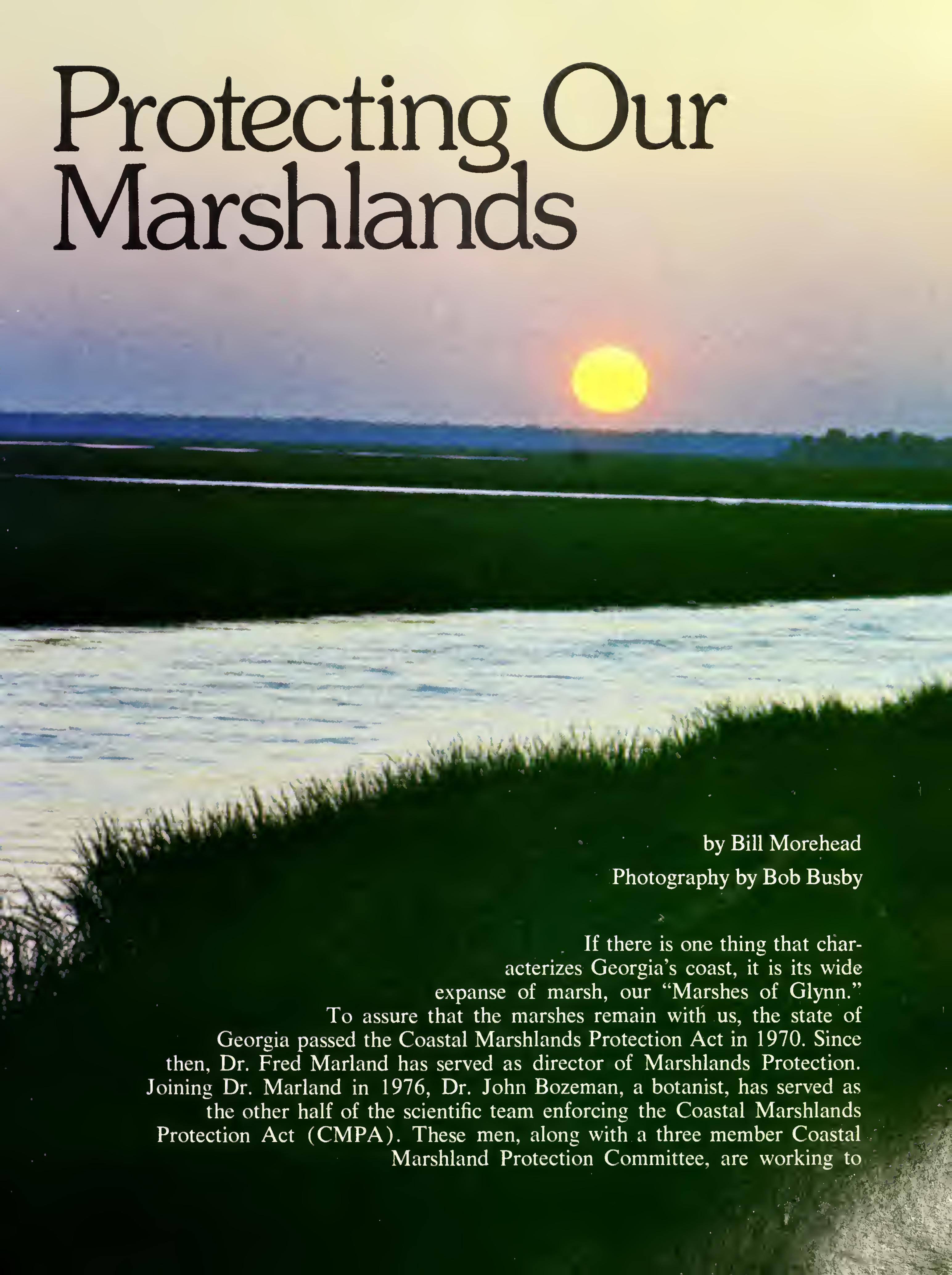
It is possible the state has an extensive warm water aquifer. An oil test well drilled recently in Wayne County produced water that was about 140 degrees. Geologists think the water is heated by very low levels of radioactivity in ancient volcanic rock thousands of feet below the surface. "We believe a warm water aquifer may underlie 1,000 or so square miles of the coastal plain from Brunswick to Hazelhurst to Sylvania to Savannah and on into South Carolina," Mr. Pickering said.

Upcoming tests will confirm or refute the theory but it is an exciting possibility.

Meanwhile, there are people around the state who are studying the fracture systems of granitic rocks, the size and porosity of limestone formations, weather patterns, the rate of flow in wells, springs and streams, water quality, how much of the potential flow is currently being used and a great many other things associated with groundwater in Georgia.

When it is all together, it will solve many of our water problems.

Protecting Our Marshlands



by Bill Morehead

Photography by Bob Busby

If there is one thing that characterizes Georgia's coast, it is its wide expanse of marsh, our "Marshes of Glynn." To assure that the marshes remain with us, the state of Georgia passed the Coastal Marshlands Protection Act in 1970. Since then, Dr. Fred Marland has served as director of Marshlands Protection. Joining Dr. Marland in 1976, Dr. John Bozeman, a botanist, has served as the other half of the scientific team enforcing the Coastal Marshlands Protection Act (CMPA). These men, along with a three member Coastal Marshland Protection Committee, are working to

Georgia has 600,000 acres of tidal marsh, the most productive part of the estuarine ecosystem.

make sure that exploitation and unnecessary destruction of the marshes does not take place.

Is the CMPA working? Are we saving or losing our marshes? What is the future of the marshes and with them, the Georgia coast?

To answer these questions, I interviewed Dr. Marland for *Outdoors in Georgia.*

Dr. Marland, why did we—why do we—need a Marshlands Protection Act in Georgia?

MARLAND: There was a great amount of activity on the Georgia coast during the late 1960s, and there was a corresponding amount of public support for marsh conservation. We have some 500,000 acres of marsh in Georgia. Hundreds of people took active parts in passing the 1970 Marshlands Protection Act which went into effect on July 1, 1970.

The chief author of the bill was Reid Harris, an attorney from Brunswick. One person leading the floor fight in the state House was George Busbee. Busbee's roommate at that time in the Legislature was state Senator Al Holloway. Senator Holloway probably had more to do with getting the bill passed than anybody. To be fair, the bill's passage was a tribute to a whole host of people: George Bagby, Speaker George Smith, Dr. John Hoyt, Dr. Gene Odum, Jim Morrison, Garden Clubs of Georgia and the League of Women Voters. And of course, the other members of the General Assembly who wanted to insure that Georgia's coastal marshes are used in the public interest for the benefit of all Georgians.

But these marshes have been here for thousands of years. Why did they need special protection in 1970?

MARLAND: Up until 1967 the marshes had essentially preserved themselves. A marsh was a hard place to build on in the nineteenth century. The marsh and the elements are formidable opponents of hand labor. In the twentieth century, our big machines cannot only build on the marshes, they can obliterate them.

The rate of development caught up with Georgia's marshes in the late 1960s. For example, some 4,000 acres of marsh were used in the construction of Interstate 95. Some of us on Sapelo at that time (University of Georgia scientists) realized we were studying marsh habitats that might well become extinct.

People for so long, for hundreds of years really, had taken the marsh—and its yield—for granted. The average citizen didn't consider where the fish, oysters, crabs, shrimp were coming from. Suddenly, these huge machines that were building the Interstate were on the marshes, and it was clear that man had the ability to change forever the marsh's integrity.

Spartina alterniflora, *the marsh grass that contributes so greatly to the productivity of the tidal marsh, provides food and cover for many marsh creatures such as the snail,* Nassarius.

Did the proposed phosphate mining of the late 1960s also play a role?

MARLAND: Yes. For example, one company proposed to strip mine roughly one-half the marsh acreage in Chatham County (in order to obtain phosphate for fertilizer) and then turn parts of the mined area into filled land for real estate development—a sort of double payoff.

Was it the potential threat of phosphate mining that united the conservation groups into supporting the Marshland Protection Act?

MARLAND: Right. It was the trigger—it was not the main force but it was certainly the trigger.

How does Georgia's marsh protection compare with other states?

MARLAND: You need only get in an airplane and look over our sister states to answer that. Flying over the Carolinas or Florida, you would see we've done a better job of protecting our marshes.

But this is a little bit unfair in one sense because South Carolina just this past year passed a similar protection act. They have not had a state act before. Florida has passed an act of sorts, but they mainly govern by rule and regulation, not statutory authority.

Georgians have been very, very vigorous—citizens, county governments, the Corps of Engineers, the courts. All have had a role in recognizing these quite unique marsh landscapes.

What would have been different in the last seven years had we not had a Marsh Protection Act?

MARLAND: We would have had what you see in other states—a house resting on filled marsh, a little canal up to the house, a boat.

Filled marsh—the key thing about dredging and its provisions in the Coastal Marshlands Protection Act is while we allow creek dredging, we do not allow people to take the dredged material and fill marsh. We do not allow them to offset their costs of dredging by filling in our marshes and selling the fill for a real estate development.

Had we not had a Marshland Protection Act you would see roads, houses, shopping centers, fill lots, keys and lagoons (like Florida), all of these completely dominating our marsh.

As the resource manager of our Marshlands Protection Act, how much of your work is objective enforcement of the Act and how much is in end-running political desires? Do you spend lots of your time in intangible discussions with people who somehow want to bend, break or otherwise abort the Act?

MARLAND: To a degree there is a hierarchy and the Peter principle operates. You can't get away from it. In my case I have been freer than most bureaucrats, and the feedback loop between myself and the bureaucracy is short and quick. The top resource managers in state government participate directly in resource allocations of the marshes in monthly meetings.

But I have been in this job for six years and I have been remarkably free from interferences from the three governors I have served under. Every decision we make, of course, takes place in a political context; economic, political, ecological, environmental factors all interplay.

In our society there is no way to make a so-called ecological decision in a vacuum. Especially one that denies people jobs, due process, and so forth. There are too many checks and balances in our system to permit that. I would say I spend some 20% of my time on paper work and 80% out in the field dealing with people and marshes.

In the six years of the CMPA, what has been the nature and character of the requests to alter the marshes?

MARLAND: Each request to the Coastal Marshlands Protection Committee is considered by the Committee—which is made up of Commissioner Joe Tanner, Leonard Ledbetter (Director, Environmental Protection Division) and Jack Crockford (Director, Game and Fish Division).

After the law became effective on July 1, 1970 until January 1972, there wasn't anyone on the job. Coupled with this lack of personnel, there was a rush by developers, to get modifications made on the marshes before the law—with sufficient enforcement personnel to give the law teeth—became effective.

After this rush, which took me another two years to catch up with, we found we were being worked to death. When the job was just about to grind us down, the economic recession hit. The 1974 recession, coupled with the energy crisis, acted as a severe damper on all construction work (permitted and unauthorized) in our marshes.

You mean the 1974 recession had a positive effect on marsh protection?

MARLAND: Oh, yes, definitely a beneficial effect on our marsh resources.

So the very same economic sluggishness that almost everybody in the country considered negative was—ecologically—an accidental boon to our marsh protection program?

MARLAND: Yes. Conversely, during the booming times of the late '60s and very early '70s as contractors were finishing up sectors of Interstate 95, the operators of this equipment (draglines, dump trucks, bulldozers) had all manner of heavy work machines sitting in, around and on the marsh.

If the neighbor down the street wanted something done he simply went out and got his friendly dragline man who during the week worked on I-95 and on the weekend was idle, and the dragline man came and cut a canal through the marsh or whatever.

The socio-ecological impact of having that much earth moving equipment on and around the marshes was enormous. Perhaps the side effects of the equipment being present did as much damage as the construction of I-95 itself.

You have raised another interesting point: the spin-off of unauthorized marsh destruction by massive equipment being present for authorized marsh alteration.

Do you fear the same sort of accidental, unauthorized alteration of the marsh from such projects as the nuclear submarine base at Kings Bay in Camden County?

MARLAND: Yes, there is no question about it. However, we will monitor this very closely—and we are in a far better position to control such marsh alteration today than we were in the days of I-95 construction.

How are you in better control?

MARLAND: Well, an applicant must submit a joint application to the Corps and to the State for any alteration of the marsh. A single two page form satisfies both levels of government. If it is clear that what they propose is not going to be acceptable to the Marsh

Protection Committee, we try to show them why—and we try to give them a reading on it in the field.

The Committee meets each month to review all the applications made. A joint public notice is circulated by the Savannah District Corps of Engineers. A week or ten days before the meeting we send these materials to the committee, send notices of the meeting to the press. The committee meets on alternate months on the coast and in Atlanta.

The committee requires Dr. Bozeman and myself to make a study on each application, including a citing of the pertinent law or regulation. After the Committee takes action on the application, there is a period of 45 days for appeal. Whether the permit is accepted or denied, there is this 45 day period for appeal.

Generally, water-oriented activities such as marinas are permitted and residential developments on marsh fills are denied.

Our public review process is a crucial part of the review and assessment of applications to alter the marsh. Citizens send in their comments pro and con by letter and also appear before the committee to express their views. This public review gives both developers and environmentalists, for example, and other citizens, an opportunity to comment on the applications.

Dr. Marland, how do you view the future of Georgia's marshes? Will the CMPA continue to work?

MARLAND: The chances are quite good we will continue to have plenty of marsh acreage. The ethic of land use in the marsh has been established in Georgia.

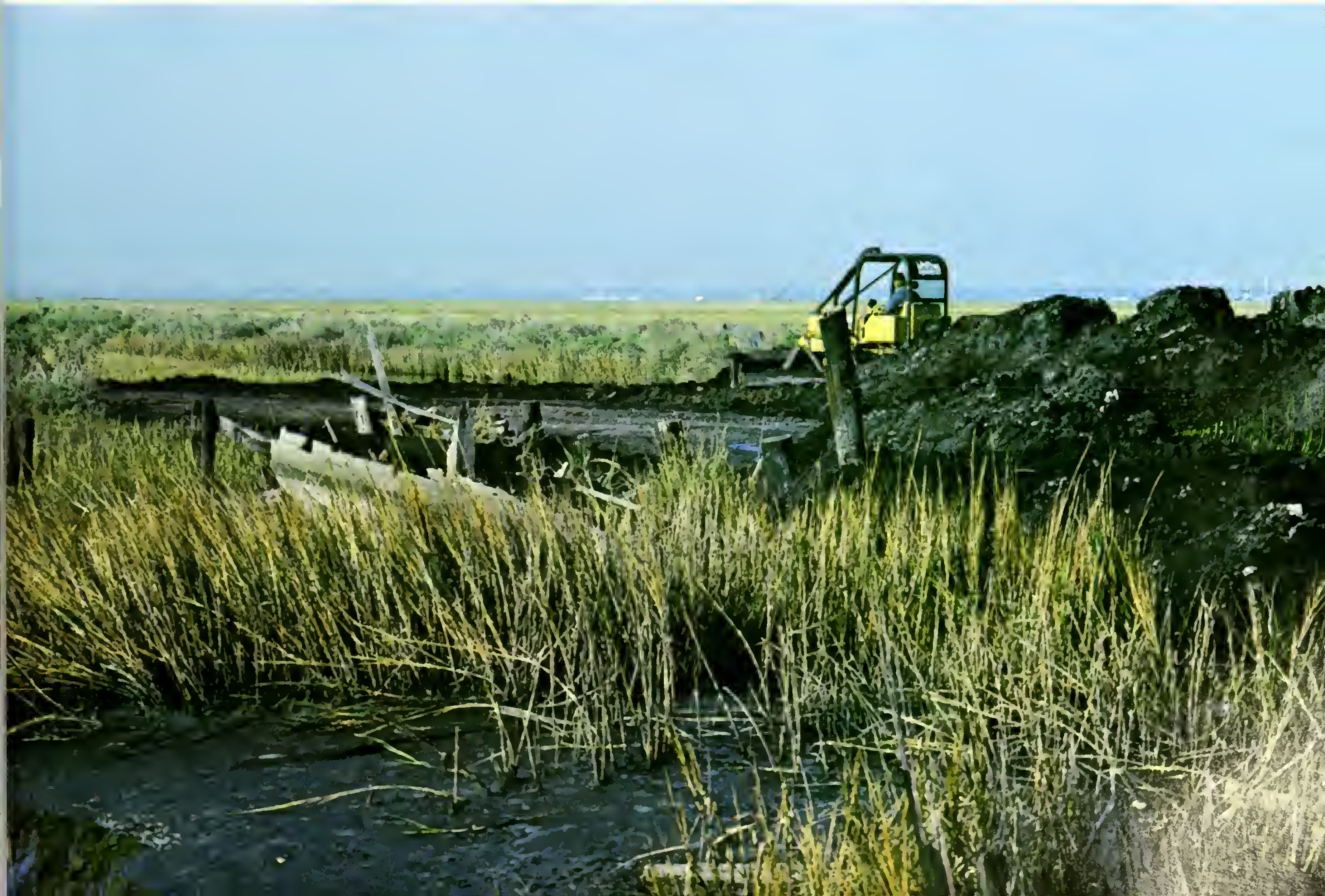
The concepts of chance apply. We are fortunate in not having Atlanta sitting where Savannah is, for example. If that were the case, I'd be just an urban biologist putting out little fires.

We do have such major cities located throughout the U.S. in and around what used to be marshes. I won't name them, but anybody knows what cities they are. Viewed in satellite photography, these sprawling urban masses appear as scabs on the flesh of the landscape. The sprawl of an urban area on the fabric of the earth is a force our society hasn't faced yet. Our ability to alter the land far exceeds our understanding of the changes.

Savannah is not only a smaller city, but historically it has come to grips with its environment. It has been a planned city since Oglethorpe, with parks, trees and open spaces. The future of Savannah I think is to vigorously protect its marsh areas, while allowing necessary utilization that's in the public interest.

I think the state as a whole will do that, too. In the main, I think our vast marsh areas will be preserved, and not just for the hunting, fishing, and other recreation but as a vital resource renewal area and also as a place where nature is left to do her part.

The Coastal Marshland Protection Act, while not prohibiting marsh alteration, requires such alteration to occur only after its purposes are examined in view of the ecological consequences.



Ochlockonee

Jimmy Valentine

Redbreast and Bass

by Dick Davis

A sun-filled day, shirtsleeve warm; a picture book South Georgia river with a known high population of sporty, palate-pleasing gamefish; a two-man boat; ultra-light tackle in hand, and a rooster tail popping the water among the tree roots near the bank. This is fall redbreast angling on the Ochlockonee River, and these are the makings of some rewarding fishing and some long-held memories of outdoor pleasures and good eating.

Amber waters, often shallow and deceptively fast moving, are screened by a thick and sometimes dense canopy of trees and undergrowth. Willows, seemingly reaching for the sides of the river, stretch out almost horizontally from both banks, sometimes almost entangling overhead and forming an arched canopy for the waters and sands of the Ochlockonee. Bald cypress adorned with Spanish moss, live oaks, pines, gums and an occasional holly and dogwood, with a variety of shrubs and small plants, line the high-rising sandy banks of the river. The amber waters contrast starkly with white sand beds of the river.

The almost pristine beauty of the river in some stretches is reminiscent of the Suwannee of Stephen Foster's famed folk song. An artist, with canvas and brush, could find here a myriad of inspirations and challenges. And doubling the images in some spots are calm dark waters, reflecting picturesque scenes like a mirror in sepia tone.

This is southwest Georgia's Ochlockonee River which was visited by DeSoto in the sixteenth century, in colonial days was the home of the Seminole Indian, and whose inviting waters beckon the boater with shallow draft vessel of john boat vintage, the canoeist or the rafter.

But the real delight of the Ochlockonee is revealed when its almost silken surface is pierced by a lure or live bait guided by the hands of the experienced river angler.

For the river's waters support an excellent population of gamefish to delight the sport fisherman. Stars of the Ochlockonee's gamefish lineup are the freezer-filling largemouth bass, the tasty redbreast, the sporty and food staple channel catfish, bluegill, redear (shellcracker) and speckled perch or crappie.

Occupying a special spot in the roster of Ochlockonee game fish is the Suwannee bass, for it was in Barnetts Creek, a tributary of this river, that the presence of this species in Georgia was first confirmed in 1974. This special species, a member of the sunfish family which was originally thought to occupy a range limited to the Suwannee River drainage in northern Florida, is thought to be a species closely related to the spotted bass. Although on the threatened list, the Suwannee bass is believed to be surviving in fair numbers in the Ochlockonee.

Striped bass also are found in the Ochlockonee, making their way up river from north Florida's Lake Talquin.

In addition to affording good chances of rewarding catches, the Ochlockonee River also provides the tempting challenge of boating a trophy bass or redbreast for a conversation piece and bragging rights. Largemouth of eight and ten pound size have been taken in recent months from the stretch of the river between the U.S. Highway 19 bridge north of Thomasville and the Florida line. Redbreast come in sizes that would fill the large hands of any wide receiver in pro football. Suwannee bass of two to three pounds have been harvested from the river, and a new world record of over 3½ pounds is there for the taking.

Most Ochlockonee anglers use light tackle or the versatile, time-honored cane pole. A small, flat-bottomed two man boat is the most suitable transportation for fishing the winding, often very shallow river. Either the shallow-draft, flat-bottomed boat, a raft or a canoe is the only practical means of maneuvering in the vegetation of fallen and overhanging trees which partially block passage along the river.

Redbreast can be taken on ultra-light tackle using a rooster tail or

Bill Bryant

Mepps spinner. The redbreast can usually be found in fast water around the tree roots—cypress and other species—which fan out in the edge of the stream, the individual roots exposed and jutting into the river where the water flow has undercut the tree.

The overhang of willows, cypress and other vegetation challenges the angler to place his bait or lure in a likely spot for the redbreast or bass. Often the cast by boater or wader must be almost horizontal to the water and just two or three feet above the surface to avoid an entangled line and the utterance of some unmentionable phrases. And the lure or bait must be placed right on target to clear the roots and vegetation which often shroud the river banks.

Bank fishing is also popular along the Ochlockonee. The steeply rising sandy banks which characterize the river in many places afford good vantage points for casting or cane pole fishing.

Bush hooks, baited primarily for channel cats, are strung from overhanging trees into the water. Boaters need to be on the lookout for these abandoned bush hooks as they pose an everpresent danger of hooking clothing and flesh.

Some anglers don waders to get their supper. The many shallow stretches of the river and the character of the river bed, especially above Thomasville, make wading a very practical means of fishing in the constricted openings and recesses along the banks of the river. The uninitiated wader should be warned that the dark waters of the Ochlockonee, as in other rivers, can be dangerously deceiving as to "fall-offs" and variations in depths. Only a step or two away from where a wader stands in knee-deep water, the river bottom may drop off precipitously to eight or more feet in depth.

The Ochlockonee River rises in the southern part of Worth County and flows southwestward through Colquitt, Thomas and Grady counties and into north Florida and Lake Talquin on its way to the Gulf of Mexico near Panacea, Florida.

To the west, the Little Ochlockonee rises in west central Colquitt County and moves southward into Thomas County and its junction with the main part of the river just north of Thomasville.

Barnetts Creek, a principal tributary of the Ochlockonee, comes out of northwest Grady County and flows souheastward to form the boundary of Grady and Thomas counties and joins with the river west of Thomasville. Tired Creek is another major tributary of the Ochlockonee within Grady County.

On the southernmost stretches of the Ochlockonee River in Georgia —from the point where U.S. Highway 19 crosses the river north of Thomasville to the Florida line, a distance of about 25 miles as the crow flies and 35 miles as the river meanders—there are five main entry points into the river for boaters. One is at the Hadley's Ferry Road area, south of Cairo; another is where Georgia 93 crosses the river. Other points for putting in boats are the U.S. Highway 84 crossing of the river between Thomasville and Cairo, below the old U.S. Highway 3 bridge and where the river flows under U.S. Highway 19 near the junction of the Ochlockonee and the Little Ochlockonee. There is ready access to any of these entry points, but at all the points there are only natural ramps of deep and sometimes treacherous sand. No concrete boat launching ramps are presently available along the Ochlockonee. Small, primitive-type ramps are needed and have been recommended for the lower Ochlockonee, but as of this time none have been installed.

Oxbows—small lakes or ponds that jut off the main river stream—are found along the Ochlockonee in the area a few miles north of Thomasville. These waters afford good fishing but are sometimes difficult to maneuver in with an outboard due to shallowness, downed trees and floating debris. Some local anglers actually forsake the outboard in favor of a long pole to move their boats.

The high gamefish population of the Ochlockonee is evident from the results of fish population studies completed in 1975 by fisheries biologists of the Game and Fish Division. These population studies showed that in some areas near the Florida line the river has up to 350 pounds of fish per acre.

The southern portion of the Ochlockonee in Thomas and Grady counties usually affords the best boating and fishing. In the northern portion of the river in Worth and Colquitt counties, the river alternates from a swampy stream with a poorly defined channel to a free flowing stream in a low, wooded flood plain with stands of cypress, gums and other hardwoods. In this upper portion of the river, high sandy banks are uncommon, and the stream bottom consists mostly of mud and sand.

In the lower part of the Ochlockonee in Thomas and Grady counties there are two outcroppings of limestone, creating small, shallow shoal areas in the stream. One of these areas is on an S-curve and is a picturesque area known locally as "Babbling Brook." The shallowness of the water in most of this area precludes boating and is most inviting to the wader.

The discovery of Suwannee bass in this river is of special interest since most of the Ochlockonee is not typical habitat for the species, which has been known as a shoal species associated with limestone outcropping. The Suwannee bass taken in the Ochlockonee River itself, apart from Barnetts Creek, have been found over smooth, sandy bottoms.

Interested in a canoe or rafting trip on the Ochlockonee? Try the southernmost stretch in Georgia, from where Georgia Highway 93 crosses the river to Hadley Ferry Road or to a paved road just below the Florida line. Each of these stretches are about 15 miles by water and could be a memorable excursion. Better allow a full day (sunup to sundown) to enjoy it to the fullest—and maybe catch a trophy bass or some of those big and fat redbreast.

Outdoor Sketchbook

COTTONTAIL RABBITS

by Joseph C. Kurz
Wildlife Biologist

The Eastern cottontail rabbit *(Sylvilagus floridanus)* is found throughout the United States east of the Rocky Mountains. It is the most common of the four species of rabbits found in Georgia. The other species are the wood rabbit *(Sylvilagus transitionalis)* which is found in the mountains, the swamp rabbit *(Sylvilagus aquaticus)* which inhabits the rivers and creek bottomlands throughout the Piedmont, and the marsh rabbit *(Sylvilagus palustris)* which is found along brackish marshes and flood plains of the Coastal Plain.

The cottontail rabbit ranks fifth in popularity among game species in Georgia. However, over the last few years its popularity has diminished, primarily due to the declining rabbit populations in the Piedmont and Mountain Regions. Cottontail rabbit populations in the Coastal Plain remain high and are often considered a nuisance to crops.

Population

Population densities vary greatly with habitat and land use patterns. Studies in the Georgia Piedmont on pasture and woodlands found rabbit populations to vary between 2 and 8 acres per rabbit. Rabbit populations are considerably higher in the more agricultural coastal plain and less abundant in the mountains.

Rabbits usually occupy very small home ranges of 1 to 5 acres in size. Range size will vary with the habitat, population density, season and sex of the animal. Males usually have larger home ranges than do females.

Habitat

The cottontail is primarily an animal of the woods and old fields. It was found that during the fall the five most important cover types used were woods, weeds, brush and weeds, broomsedge and pasture. Studies conducted in Georgia indicated that rabbits inhabited pine stands with dense undergrowth and old fields. Open pastures and hardwood forests were utilized very little.

Food

Rabbits are herbivorous animals which eat a wide variety of vegetation. Winter foods consist of shoots and woody twigs from such plants as blackberry, sumac and wild cherry. Herbaceous plants such as clover, lespedeza, vetch and honeysuckle are also included in the winter diet. Rabbits may cause damage in apple and peach orchards by girdling the seedlings at this time of year. The cottontail's spring and summer diet includes the succulent new growth from herbaceous plants. Some of the more favored of these plants are paspalum, clover, crabgrass and plaintain. Favorite agricultural crops include soybeans, oats, wheat and garden vegetables.

An important part of the food habits of cottontails is the re-ingestion of feces which is known as coprophagy. The rabbit produces a special soft pellet which is re-ingested during the night. This is done because the bacteria in the rabbit's digestive tract does not do a thorough job of digesting the food the first time through. The rabbit therefore passes it through again to get the additional nutrients. If the rabbit were prevented from ingesting this pellet, it would die within two to three weeks.

Reproduction

Research conducted in Georgia showed that cottontails breed from February through October, however the peak breeding period is March through May. During this peak period, nearly 100 percent of the adult females are pregnant.

Rabbits have a twenty-eight day gestation period and usually breed the same day that they give birth. Ovulation is induced by copulation. They therefore have the potential of producing seven or eight litters annually, although they rarely do this. Three or four litters per year are typical, with three rabbits per litter. Rabbits have smaller litters in Georgia than have been found in more northern states.

Rabbits construct a nest cavity by scooping out a hollow depression in the ground and lining it with grass and hair from the under parts of the body. After the young are born, the female conceals them by covering the nest with dead grass.

The young are born naked and in a helpless state. While in the nest, the female nurses the young twice a day, at morning and at dusk. They grow fast and, within 10 to 20 days of age, leave the nest.

Occasionally, rabbits breed the same year as their birth. A Georgia study found that approximately 3% of the females born breed the same year of their birth. The earliest recorded conception occurred in a 99-day old rabbit.

Natural Mortality

Rabbits like most small animals have a very short life expectancy. Of those born in the spring, approximately 20% live to be one year of age, and less than 1% reach three years of age. Cottontails make up for this high mortality rate through high reproductive capacities.

Rabbits succumb to all forms of mortalities, including starvation, predation, disease, accidents and hunters. These mortality factors compensate one another. In other words, if one doesn't get the rabbit, another one will.

Predators often get the blame for

In many agricultural areas, lack of cover is the most significant limiting factor affecting rabbit populations. Large brush piles are a very effective type of escape cover.

Leonard Lee Rue III

The cottontail rabbit is a prolific breeder and will rapidly take advantage of well planned management activities that provide for its basic life needs. Barring disease or other catastrophic occurrences, noticeable population increases may occur only a season or two after management activities have occurred.

low rabbit populations. Nearly all predators ranging from snakes to owls prey on the rabbit. However, predation is seldom a factor which will limit rabbit population. Predators are one of nature's ways of removing the genetically and physically weak individuals from a population. If a rabbit is weak from an overburden of parasites or lack of food or just doesn't have enough cover to hide, he will probably get caught by some predator. However, he was made vulnerable to predation by a weakness in the rabbit or his habitat.

The best way to reduce the predation period losses is to improve the habitat by providing more food and cover. Rabbits, like all prey, are more susceptible to predation when the habitat does not adequately meet their needs. The removal of predators generally will not increase the rabbit population.

Cottontails carry a wide variety of diseases. Tuleramia (rabbit fever) is the only one which has proven to be a significant factor in limiting rabbit populations. Cottontails also carry many types of parasites. Studies have shown that during late winter and early spring parasites cause the greatest stress on rabbit populations. However, individual rabbits must harbor a very large number before any sign of illness becomes obvious.

Thousands of rabbits are killed annually on Georgia's roads. Roadside mortality reaches its peak from March through May which corresponds with peaks in breeding activity. In our neighboring state of Alabama, roadside rabbit mortality during these peak months indicated that 10 to 14 rabbits were killed per 1,000 miles of highway.

While little is known of the number of rabbits which starve annually in Georgia, with mild winters and long growing seasons, it is doubtful that starvation plays a significant role in rabbit mortality.

Management

The primary needs of a rabbit are food and cover. In areas of the state where row crops and grain are the primary agriculture, there is little need to manage for food. However, "clean farming" often eliminates necessary cover from around field borders. One of the best management practices for rabbits is to allow fencerows and field borders to grow up in weeds and briars. This will provide excellent food and cover. In areas where "clean farming," grazing or forestry is practiced, it may be necessary to plant food. On these areas, small food plots (1/8 to 1/4 acres) should be planted for every 10 to 12 acres, Rye, crimson clover and hairy vetch are all very good food plants for rabbits.

Brushpiles may be beneficial if cover is obviously lacking. They have been used in many parts of the country to provide cover for rabbits and other forms of wildlife. Studies have indicated that rabbit utilization of brushpiles is directly related to the height of the brushpile. That is, the higher brushpiles tend to get, the greater the use. Brushpiles should be a minimum of five feet high and preferably eight feet or higher. The diameter of the brushpile should be at least twice the height. The most durable construction appears to be a "cross patch" pattern where each layer is stacked at right angles to the layer below. Studies conducted in Georgia have shown that brushpile construction may not increase rabbit populations if cover is already sufficient. Therefore, brushpiles should not be built unless cover is obviously lacking or if there is an abundant supply of brush from which the piles can be readily constructed.

Stocking of rabbits is generally not an acceptable practice. Rabbit population levels are related to the habitat. Most rabbit populations are at or near carrying capacity. Stocking additional rabbits beyond what the habitat can support will only cause loss of these additional rabbits to various types of mortality. Improving the habitat for rabbits is the only way to permanently increase the rabbit population. Beagle clubs have customarily stocked rabbits for field trials. While this practice does provide the necessary large number of rabbits they need for a short period of time, these populations do not remain at this high level.

Hunting

Popularity of rabbit hunting has steadily decreased over the last 10 years. In 1965, 116,000 rabbit hunters harvested over 1 million rabbits. In 1975, only 84,000 persons harvested 600,000 rabbits. This decline can probably be attributed to the decline in the number of rabbits and the increased expense of keeping rabbit dogs.

Even though rabbit hunting has declined, it is still enjoyed by people hunting with or without dogs. Rabbits are also an excellent game animal for young hunters to learn the sport of hunting. While at the present time, rabbits are an underrated game species, they will increase in importance as Georgia becomes more urbanized.

The Georgia Department of Natural Resources, Game and Fish Division, assists landowners in managing for wildlife. For more details in managing for rabbits and other species, contact the nearest Game and Fish Office and a qualified wildlife biologist will gladly inspect your property and provide the necessary management plan.

Rabbit hunting usually means beagles. This one seems to be diligently searching some likely looking cover for a trace of rabbit scent.

Outdoors in Touch

edited by Susan K. Wood

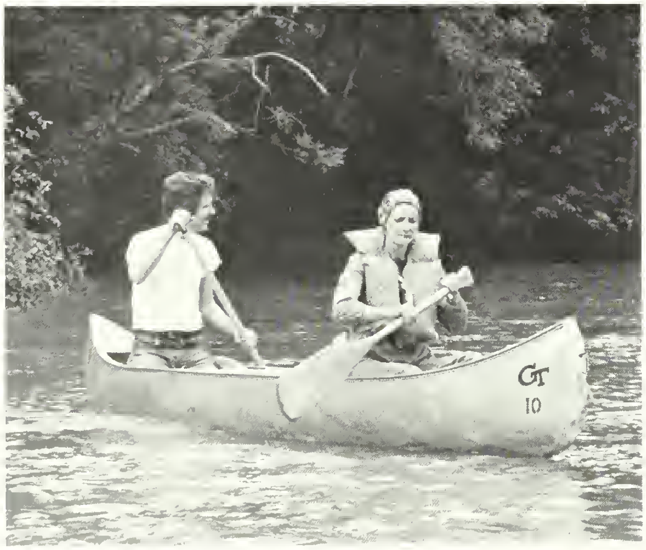
CHATTAHOOCHEE RIVER PARK PASSES U.S. HOUSE

The U.S. House of Representatives has approved a bill creating a national recreation area on Georgia's Chattahoochee River. The vote, taken on Valentine's Day, was 273 to 79.

Congressmen, state officials and conservation groups have been trying to get this bill passed for three years. If passed by the Senate, the bill will set aside 6,300 acres in 14 tracts from Buford Dam to Peachtree Creek. This Chattahoochee River National Recreation Area would become part of the U.S. National Park Service.

Atlanta congressmen Wyche Fowler (5th District) and Elliott Levitas (4th District) were strong supporters of the bill and welcomed its passage. Commented Levitas, "I think the people who are really responsible for it (passage of the bill) are those citizens who have from the beginning realized the potential and stayed behind it."

Congressman Fowler voiced his approval by adding, "This is a Valentine for future generations."



SAPELO ISLAND NOW OPEN TO VISITORS

Tours of Sapelo Island can now be made on a limited basis.

Boat trips, limited to 25 people, are taking visitors to the island preserve for a three-hour tour each Saturday.

A portion of the 9,250 acre island is set aside for research by the University of Georgia Marine Institute. Most of the island, however, is owned and maintained by the Department of Natural Resources as a wildlife refuge.

A tour boat leaves Meridian Boat Landing in McIntosh County at 9:00 a.m. each Saturday and returns at 12:30 p.m. The boat dock is located near Darien on U.S. 17 north of Brunswick.

Reservations can be made by calling (912) 485-2449 or (912) 485-2242.

SPRING RAFT RACES

Planning to participate in one of the many upcoming raft races to be held throughout the state this spring? If so, remember that even in a raft you have to abide by the PFD (personal flotation device) rules for safe water recreation.

To refresh your memory, Georgia law requires that every vessel (and a raft is considered to be a vessel) must have on board one Coast Guard approved PFD for each person on board. The length—or class—of the vessel determines which type personal flotation device is required. Class A vessels (less than 16 feet in length) are required to have readily available at all times at least one Type I, II, III or IV PFD for each person on board.

Since most rafts are less than 16 feet long, they must have either a wearable life jacket (Type I, II, or III) or a throwable device (Type IV) for each person in the raft.

Since October 1, 1972 all life preserving devices have been required to be marked with the type as designated by the Coast Guard. This makes it easier to choose the proper PFD for the watercraft in which it is intended to be used.

The PFD requirements are explained in more detail in the booklet "Georgia Safe Boating Guide" which is available from the DNR Office of Information and Education, 270 Washington Street, S.W., Atlanta, GA 30334. Write for the book—reading it could save your life.

NEW PARK FILM AVAILABLE

The Department of Natural Resources has released a new film, "GEORGIA Parks and Historic Sites." This 20-minute film explores the abundant natural and historical resources that abound in the state parks system.

"GEORGIA Park and Historic Sites" is available on a free-loan basis throughout the summer from the Office of Information and Education, and at selected parks and historic sites around the state.

Outdoors in Georgia

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If you enjoy the outdoors—boating, camping, fishing, hunting, hiking—you'll enjoy **Outdoors in Georgia,** a monthly magazine published by the Department of Natural Resources.

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Subscribe now. Rates are $5 for one year, $8 for two years and only $9 for three years.

MORE ABOUT COVERED BRIDGES

"Georgia's Romantic Bridges" is the title of a new booklet published by the Georgia Department of Transportation. The 21-page booklet provides locations as well as black and white photographs of the 18 remaining covered bridges in Georgia. Detailed county maps that are included will make it easier for Georgians to find these relics of the past.

Several years ago, DNR published a full-color brochure about the state's covered bridges. Since then, several of the structures have been destroyed, but DNR has been unable to print a revised brochure. Because of **Outdoors in Georgia's** story on covered bridges in June 1977, many people have requested more information.

To obtain a copy of DOT's "Georgia's Romantic Bridges" write Public Information Office, Department of Transportation, 2 Capitol Square, Atlanta 30334. There is no charge.

PUBLIC INPUT SOUGHT

The Georgia Conservancy has initiated a public participation program in coordination with DNR's Environmental Protection Division designed to increase citizen awareness of Georgia's valuable water resources, and to assist the public in learning about and commenting on the state's plan to clean up Georgia's waterways.

The state plan will determine where sewage treatment plants will be built, how big they will be, what industrial discharge into rivers will be permitted and other methods of improving water quality.

The Conservancy has prepared a brief summary of the state water quality program which is available to all interested Georgians who would like to offer their personal opinions about it. It is an important opportunity for any citizen to influence the way that the major state clean-up program is carried out.

For additional information contact The Georgia Conservancy, 3110 Maple Drive, Atlanta, Georgia 30305 (404 262-1967).

SUN DAY, MAY 3

May 3 has been designated as Sun Day, a nationwide observance focusing on the use of solar energy as an alternate energy source. Sun Day marks the official beginning of national Sun Month (May).

The biggest event planned for Sun Day in Georgia is a rally in Atlanta's Central City Park. There will be demonstrations of solar cookers, water heaters and other uses of solar energy, workshops featuring experts and students from Georgia Tech as well as local and nationally-known speakers.

Other events planned include speakers and exhibits at the Unitarian Universalist Congregation of Atlanta, April 30-May 7; tours of solar-powered buildings and exhibits of solar systems in Athens, Atlanta, Shenandoah, Valdosta and other cities; an energy planning conference at Georgia Tech, May 1-2; a solar fair at Georgia Tech, May 3; a sunrise celebration and bird watching at Kennesaw Mountain, May 3; the Sun Cycle bicycle ride past solar facilities in Atlanta, May 7; solar fairs in Savannah, Macon, Shenandoah and at Georgia Tech; a Run for the Sun foot race in Atlanta; and workshops on greenhouse construction and solar hot water heaters, also in Atlanta.

The Atlanta rally and all other Sun Day events are being planned by the Georgia Conservancy. Contact them at 404 262-1967 for more information.

IMPORTANT NOTICE FOR *OIG* SUBSCRIBERS

Starting with the August issue of *Outdoors in Georgia*, we will be changing over to a more complete readership service system. The new system will handle subscriber records, allow us to retain more complete subscriber information, and produce the mailing labels that go on your monthly magazines. We hope that this new, more modern system will ultimately result in better service to you, the subscriber.

In the meantime, there may be some initial problems. The revision will affect every name in our current readership file, and in a change of this magnitude someone might get lost in the shuffle.

We ask only two things—your patience during the transition period and your reporting of any problems you have receiving the magazine after August 10th. If you do not receive the August issue of *Outdoors in Georgia* by that date please notify us, sending along the label off the lost magazine you received.

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